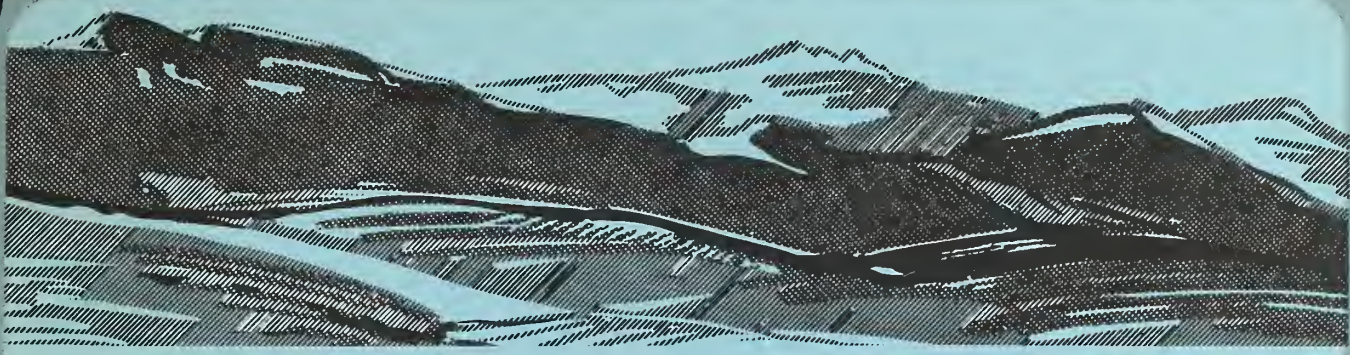


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NOTES

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FOREST SERVICE — U. S. DEPARTMENT OF AGRICULTURE
INTERMOUNTAIN REGION — OGDEN, UTAH



STATEMENT OF PURPOSE

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This publication is printed primarily to inform professional range administrators of important range improvement and management developments and findings. These "NOTES" may include extracts of published papers, unpublished preliminary reports of research work, unpublished reports on administrative studies and personal observations or suggestions of other range administrators. No claim is made as to the accuracy or completeness of studies or conclusions drawn.

All who read these RANGE IMPROVEMENT NOTES are encouraged to submit material for publication, or suggestions for improving its usefulness. Full credit will be given for any material used.

- o O o -

PLANTS FOR REVEGETATION OF ROADCUTS AND OTHER DISTURBED OR ERODED AREAS¹

A. Perry Plummer²

As part of our cooperative research project for restoration of depleted game ranges we found a fairly large number of shrub and herb species that can be used to cover and stabilize eroded areas such as roadcuts, fills, roadsides and seriously eroded areas. In this research project conducted by the Intermountain Forest and Range Experiment Station and the Utah State Division of Fish and Game, we tested many of these useful shrubs and herbs on bare or eroded areas by direct seeding and transplanting.

The areas treated in our research project were those from which the topsoil had been largely removed. Six major purposes for establishing vegetation on such areas are:

1. Stabilize the site against erosion and reduce hazards of silt pollution in streams.
2. Prevent undesirable plants from gaining a competitive foothold.
3. Beautify the area with desirable vegetation.
4. Establish vegetation to screen unsightly backgrounds.
5. Furnish shade and food for wildlife.
6. Provide shade and pleasant environment for people.

METHODS

In our restoration work we tried nursery stock, greenhouse and cold frame seedlings, cuttings, and wildings. The transplanting technique used was varied considerably according to species. We also tried direct seeding especially with the herbaceous species. In this short review, emphasis has been placed on shrubs because of the recent demand for such information. However, grasses and forbs serve to stabilize the soil and provide forage and are important providers of appropriate cover in association with the shrubs. They perform important functions in stabilizing soil, as well as providing forage.

Techniques for transplanting shrubs differ considerably depending on species and the planting site. Because of the difficulty of operating machinery on many of these disturbed areas, Pulaskis, shovels, and similar hand tools must often be used. Seedlings grown in milk cartons

¹Research on which this publication is based was partially supported by funds provided by the Federal program for Wildlife Restoration--Project W-82-R.

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or similar containers within greenhouses or coldframes for 16 weeks or longer are readily established by removing them from the cartons and placing them in an adequate hole made with a Pulaski or similar hand tool. The planting of seedlings taken directly from these cartons and with no soil on the roots has often been found more effective than using 1- and 2-year-old nursery stock. As many as 25 to 100 seedlings can be grown in a carton. Planting the entire contents of a carton helps to insure establishment on harsh sites. When using this plan, only a few seedlings, or even one, should be grown in a container.

It is sometimes difficult to transport nursery stock over rough and rocky terrain; seedlings are more easily carried over these areas. Another advantage of seedlings is that they can be grown in coldframes or under plastic near the planting site; however, a source of water for the plants must be available. Damage from drying is a definite hazard when planting nursery stock. Also, the hole for the roots must be deeper than what is required for seedlings. The above requirements are an important consideration in transplanting on disturbed areas because it is often almost prohibitive to make a hole large enough to accommodate the roots of nursery stock on some of these areas. If plow furrows can be made or a tree planter can be used on the site, nursery stock is usually quite satisfactory.

Wilding material can often be used successfully. Also, in some instances, inserting cuttings of oldman wormwood³ and various willows in the wet ground in the early spring results in successful establishment if the species are adapted to the sites.

USEFUL SPECIES

Included in this report are lists of shrubs (table 1),³ and grasses and forbs (table 2),³ that are useful for restoring disturbed areas. Disturbed areas are defined as: cuts; fills; scars made by equipment on roadsides; spoil areas resulting from mining; washouts caused from overground flow of water; and other places where the topsoil has slipped away when the soil mantle was highly saturated in the spring.

Based on our experience with them, the species are tentatively grouped into the vegetal or life zones to which they are adapted. For each species, zones are indicated in approximately the order of how well the species will grow in them. The firsthand knowledge you gain about plants in your area should be the best guide for choosing plants for revegetation purposes. Actually, knowing the attributes of plants within your area of concern is the most important part of the job of properly selecting species for revegetation purposes.

It is also important to know where and how to use various kinds of plants. Knowledge gained from what others have learned about them is helpful. To assist you, a short bibliography is provided, and you may wish to consult

³For scientific names of all plants in this report, see reference (7) in the bibliography.

some of the references. We realize that there is much to be learned in discovering how to best establish a cover on disturbed areas. It may be helpful to check species against the ratings of attributes in table 15 of reference 8 in the bibliography when selecting those suited for your purpose.

GROWTH HABIT OF SHRUBS

The mature stature of shrubs, or whether they are low, medium, or tall growing, is important when considering them for various types of disturbance areas or for other purposes. Shrubs in the attached lists are classified by their mature stature. This classification is only relative because size of the species varies greatly with the ecotype or strain. The suitability of a site affects the height, spread, and other characteristics of shrubs and is much more accentuated for some plants than for others. For example, where there is abundant moisture, Russian olive may be a tall shrub or a tree; whereas on a severe site it may be a low shrub, or just medium-height on sites ranging between severe and favorable. The same would be true of silver buffaloberry. Furthermore, although it is more demanding of water, the same thing may be said of narrowleaf cottonwood. Consequently, it will be seen that certain shrubs are listed in either two or all three categories of low, medium, and tall.

On most roadside sites there is a special interest in shrubs low enough so that game or livestock cannot jump out of concealment into the path of motor vehicles; deer are noted for doing this. Along some roads, it may be desirable to establish cover that does not especially attract animals so as to protect them as well as motorists from the obvious hazards.

In all four classes of plants, i.e., shrubs, trees, forbs, and grasses, one or more species from each class can often be used advantageously on a given site. It is generally desirable to plant two or more of the classes in combinations with each other.

WHERE PLANTING STOCK CAN BE OBTAINED

There is a critical need for nurseries from which desirable and adapted plants can be readily obtained for transplanting. Typical nurseries that demand intensive care may not be required, but there is a need for nursery areas that contain several different types of plants that would serve as transplanting stock on various kinds of sites. There are commercial nurseries in most states that sell shrubs, some of which are suited to certain types of disturbed areas. However, availability of needed shrubs is quite limited. Wildings can often be taken from their natural habitat in the early spring and successfully transplanted to fill some important needs.

Too often we have neglected use of our native plants in favor of something exotic merely because the latter could be more readily obtained. Among the important native shrubs of special value for stabilization purposes are mountain snowberry and desert (or longflower) snowberry. These two native snowberries complement each other very well

through the wide range of precipitation zones or moisture conditions that occur in the Western States. Mountain snowberry can be planted on sites where annual precipitation is 12 inches or more; desert snowberry can be used where there may be as little as 9 inches. There is a fairly broad area of overlap. The mountain brush zone is an area in which both of these snowberries grow well. Mountain snowberry has good adaptation up into arctic alpine sites and desert snowberry is suited down into the juniper-pinyon and lowland and big sagebrush types. Both can be transplanted or seeded. Wildings of snowberries establish especially well. Desert snowberry occurs quite abundantly in much of the juniper-pinyon type and especially in Nevada.

There are several other shrubs which can be used to advantage as wildings. Important among these are several species of sagebrush and rabbitbrush. Bush cinquefoil can be readily transplanted from places where it naturally grows. Woodsrose (the common wild rose) is another excellent shrub which can be transplanted from wildland stands.

SELECTION AND USE OF PLANTING STOCK

It is immensely important that plants be chosen that are suited to the areas on which they are planted. Look very closely at the variation between ecotypes. An ecotype of a species may not be suited far beyond the area where it grows, whereas another may have a wide range of adaptation. There are ecotypes within these and other species that vary with the climate and soil. This variation expands the range of site conditions where the species will grow. A good rule of thumb is to use plants from climates and soils that are similar to where the plantings are to be made.

Wherever possible, it is highly desirable to have a balance of shrubs, forbs, and grasses on a given site. Frequently, for esthetic value it is important to have a good representation of color throughout the growing season and forbs are the important plants in providing this. However, an assortment of shrubs also can be used to advantage in providing color.

Availability often dictates the choice of plants. As a consequence, exotics generally have been used because they could be obtained from commercial nurseries. Native plants, of course, are usually preferred to cover disturbed sites, and especially along roadsides in order to more easily harmonize the cover with the surrounding native vegetation. Of course, where exotics are adapted and will do the particular job best, there is no reason why they should not be used, and they often can be planted in harmony with the native cover.

The purpose for which plants are used, to a considerable extent, dictates the type of cover that will result. Mat formers, sod formers, bunch grasses, low shrubs, shade trees, and sometimes shrubs that have persisting fruits are needed in various situations.

Often, good wilding transplants of snowberry or similar layering shrubs (having suitable lengths of roots) can be readily pulled or dug out of

their natural stands. Usually this is done in early spring while the ground is still wet from the winter snowmelt. Also, early spring is the best time of the year to establish all types of transplant materials on disturbed areas. Sometimes similar success can be obtained in the late fall if the soil is moist during transplanting operations and remains so throughout the winter; this is particularly true if the site remains insulated by snow. However, suitable wilding transplants are more difficult to obtain in seasons other than spring. In contrast, direct seeding is most successful when carried out in the late fall and winter.

Broadcast sowing and then covering the seed with use of an anchor chain, pipe harrow, or brush drag is much preferred to drilling when direct seeding is being done; these methods are preferred because the resulting establishment of vegetation more closely approaches a natural cover. Also broadcasting and covering the seed by such equipment makes it possible to successfully establish good cover on areas that are much too rough and rocky for drilling. Anchor chains equipped with rail teeth (sections of railroad track) effectively stir up the soil and cover the seed on compacted surfaces.

PRINCIPLES OF SUCCESSFUL REVEGETATION

The survival and growth of plants are affected by the environmental factors in about this order: moisture, soil, temperature, exposure, and animal activity. These must be considered when choosing the plant materials to be used. When choosing a species for a site, next in importance to having adequate moisture, is the kind of substratum. How fertile is the soil? Is it alkaline, neutral, or acid? We do not have as many choices for wildland sites as do home landscapers. This is because it is usually not possible to haul in special soil to accommodate a preference of plants, nor is it feasible to continue to apply chemical fertilizers and water to modify the soil for special plants. Use of a good mulching material is generally helpful in getting establishment on severe sites, especially when direct seeding is used. Mulch conserves moisture and also reduces temperature which is often critical on southerly or westerly exposures. A lightly placed mulch around a transplant usually aids establishment and growth. However, on some sites this mulch may not be essential. But it may be necessary to control harmful effects of animals; perhaps rodents and other small mammals may have to be poisoned. Also, livestock frequently must be excluded from revegetated areas.

In carrying out the program, special attention should be given to the important principles for successful establishment and development of new vegetation. Important among these are:

1. Use only species and ecotypes adapted to the site.
2. Plant mixtures, rather than single species, that will stabilize the soil and harmonize with the landscape.
3. Transplant a sufficient number of good quality plants; when using the direct seeding method, plant ample amounts of good seed.

4. Make certain that transplants are properly planted and that seeds are adequately covered.
5. Do the planting in a suitable season.
6. Reduce competition from other vegetation to adequate levels.
7. Protect planted areas from damage by animals.

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Table 1.--Shrubs used for stabilizing roadcuts and disturbed areas are listed in categories based on mature stature. Vegetal types are listed in the order that species are adapted to them

Low*	Medium*	Tall*
Barberry, creeping - MB, A, SA, JP, AA Bitterbrush, antelope - JP, MB, BS, BB Bitterbrush, desert - JP, BS, BB, MB Buffaloberry, silver - MB, WM, JP Ceanothus, Martin - MB, JP, A, BS Cherry, Bessey - MB, JP, A Cinquefoil, bush - SA, A, WM Cotoneaster, Peking - MB, JP Currant, golden - MB, JP, BS, WM Eriogonum, Wyeth - MB, JP, BS, A, SA Ephedra, green - BS, JP, SS, BB Hopsage, spineless - SS, BS, JP, BB Lilac, common - MB, JP, BS, A Mountain-mahogany, birchleaf-JP, MB, BS Myrtle pachistima - MB, A, SA, JP Peachbush, desert - JP, MB, BS, SS, BB Peashrub, Siberian - MB, JP, BS Rabbitbrush, Douglas - BS, SS, JP, MB, A Rabbitbrush, dwarf - MB, BS, JP, BB Rabbitbrush, Parry - SA, A, SS, MB Rasperry, red - MB, A, SA Rose, woods (wild) - A, SA, MB, JP Russian olive - MB, JP, IS, WM Sagebrush, big - BS, JP, MB, SS, BG, A, SA Sagebrush, black - BS, JP, MB, SS, BG, A Sagebrush, bud - SS, BS, BG, IS Sagebrush, fringed - BS, JP, MB, SS Sagebrush, low - MB, A, JP, BS Sagebrush, silver - IS, JP, SS, MB Saltbush, Gardner - SS, BG, BS, JP Snowberry, mountain - MB, A, SA, JP, BS, AA Snowberry, desert or longflower - JP, BS, A, BB Sumac, Rocky Mountain - MB, JP, BS Virginsbower, western - MB, JP, BS, BB Winterfat - SS, BS, JP, BG, BB, MB, IS Yellowbrush - MB, A, SA, BS	Apache plume - JP, BB, BS, MB Barberry, Fremont - JP, BB Bitterbrush, antelope-JP, BS, MB, BB Bitterbrush, desert - JP, BS, BB, MB Bladdersenna, common - MB, JP, A Boxelder - MB, A, JP Buffaloberry, silver - MB, WM, JP Cherry, bitter - MB, JP, A, BS Chokecherry, black-MB, JP, A, BS, SA Cottonwood, narrowleaf - MB, JP, BS Currant, golden - MB, JP, BS, WM Cypress, Arizona - MB, JP, BS, BB Dogwood, redosier - MB, A, SA Elder, blueberry - MB, JP, A, BS Elder, redberry - A, MB, SA, AA Ephedra, green - JP, BS, MB, SS, BB Forestiera, New Mexican-MB, JP, BS Honeysuckle, Tatarian - MB, JP, BS Hopsage, spiney - JP, BS, SS, BB Lilac, common - MB, A Maple, bigtooth - MB, A, JP Maple, Rocky Mountain - MB, AS Mountain-mahogany, birchleaf - MB, JP, BS, A Mountain-mahogany, curllleaf - MB, JP, A Oak, Gambel - MB, JP, A Peashrub, Siberian - MB, JP, BS Rabbitbrush, Parry - SA, A, SS, MB Russian olive - MB, JP, IS, WM Sagebrush, big - BS, JP, SS, MB, BB, A, SA, BG Salt-tree, Siberian - MB, JP, IS, BS Serviceberry, Saskatoon - MB, JP, A, SA Serviceberry, Utah - JP, MB, BS, BB Squaw-apple - MB, JP, BS Sumac, Rocky Mountain - MB, JP, BS Sumac, skunkbush - MB, JP, BS, BB Wormwood, oldman - MB, A, SA, BB	Apache plume - JP, BB, BS, MB Aspen - A Bitterbrush, antelope - JP, BS, BB, MB Buffaloberry, silver - MB, WM, JP Cherry, bitter - MB, JP, A, BS Chokecherry, black - MB, JP, A, BS, SA Cliffrose, Stansbury - BS, BB, MB Cottonwood, narrowleaf - MB, JP, BS Currant, golden - MB, JP, BS, WM Cypress, Arizona - MB, JP, BS, BB Elder, blueberry - MB, JP, A, BS Forestiera, New Mexican - MB, JP, BS Honeysuckle, Tatarian - MB, JP, BS Lilac, common - MB, JP, BS, A Maple, bigtooth - MB, A, JP Maple, Rocky Mountain - MB, A Mountain-mahogany, birchleaf - MB, JP, BS, A Mountain-mahogany, curllleaf-MB, JP, A Oak, Gambel - MB, JP, A, BS Russian olive - MB, JP, IS, WM Serviceberry - Saskatoon-MB, JP, A, SA Serviceberry, Utah - JP, MB, BS, BB Sumac, skunkbush - MB, JP, BS, BB AA - Arctic alpine JP - Juniper-pinyon MB - Mountain brush BS - Big sagebrush BG - Black greasewood SS - Shadscale saltbush BB - Blackbrush IS - Inland saltgrass A - Aspen openings SA - Subalpine WM - Wet meadows

* For scientific names see reference (7) in Bibliography.

Table 2.--Forbs and grasses useful for stabilizing roadcuts and disturbed areas
with vegetal types listed in order species are adapted to them

Forbs	Grasses
Alfalfa - MB,JP,A,BS,SA,SS,BB	Bluegrass, Kentucky - SA,A,AA,MB,JP
Aster, Pacific - MB,A,JP,SA,WM,BS,IS	Brome, meadow - A,SA,AA,MB,JP
Aster, blueleaf - MB,A,SA,JP,BS	Brome, mountain - A,SA,MB,JP
Balsamroot, arrowleaf - JP,MB,BS,A	Brome, smooth - SA,A,MB,WM,AA
Bouncing-bet - MB,JP,A,BS	Fescue, hard - A,SA,MB,BS,JP
Checkermallow - A,SA,MB,WM	Foxtail, meadow - SA,WM,A,MB,IS
Crownvetch - MB,JP,A	Oatgrass, tall - A,AA,SA,MB
Daisy, common oxeye - MB,JP,BS	Orchardgrass - A,MB,SA,JP,BS,BB
Eriogonum, cushion - MB,A,SA,BS,JP	Quackgrass - SA,MB,AA,A,BS,IS,BG
Flax, Lewis - JP,MB,BS,A,SA,AA,SS,WM	Reedgrass, chee - MB,SA,A,JP,BS
Geranium, sticky - A,SA,MB	Ricegrass, Indian - JP,BS,SS,BB,MB
Gianthyssop, nettleleaf - A,SA,MB	Sacaton, alkali - IS,BG,BS,SS,BB
Goldeneye, Nevada - JP,MB,BS,BB	Wheatgrass, bearded bluebunch-BS,JP,MB,SA,A
Goldeneye, showy - A,MB,SA,AA,JP,BS	Wheatgrass, bluestem - BS,JP,MB,SS,BG,BB
Goldenrod, low - SA,AA,A,MB	Wheatgrass, Fairway crested-JP,MB,BS,SS, BB,BG
Goldenrod, Parry - MB,JP,A	Wheatgrass, Standard crested-JP,BS,SS,MB,BB
Helianthella, oneflower - MB,JP,BS, A,SA	Wheatgrass, intermediate - MB,A,JP,BS,SA,BB
Iris, German - MB,JP,BS,A,SS,BB	Wheatgrass, pubescent - MB,JP,A,BS,BB,IS
Lupine, mountain - SA,AA,A,MB	Wildrye, creeping - IS,BG,JP,WM
Lupine, silky - A,MB,JP,BS	Wildrye, Great Basin - MB,JP,A,IS,WM,BS
Penstemon, Eaton - MB,JP,BS,A,BB,SS	Wildrye, mammoth - MB,JP,IS,BS
Penstemon, little cup - MB,JP,BS	Wildrye, subulosa - MB,JP,BS
Penstemon, Palmer - MB,JP,BS,BB	Wildrye, Salina - JP,BS,BG,IS,MB,SS
Penstemon, Rydberg - SA,A,MB	
Penstemon, toadflax - MB,JP,BS,BB	AA-Arctic alpine JP-Juniper-pinyon
Sweetclover, yellow - MB,JP,BS,A, BG,IS	MB-Mountain brush BS-Big sagebrush
Sweetvetch, Utah - MB,JP,BS,A,SA	BG-Black greasewood SS-Shadscale saltbush
	BB-Blackbrush A-Aspen
	IS-Inland saltgrass SA-Subalpine
	WM-Wet meadows

Poisoning Cause From Milkvetch Discovered *

(Astragalus miser - refer to page 56 of USDA Bulletin No. 327 "22 Plants Poisonous to Livestock in the Western States") The poisonous substance in timber milkvetch has been identified by a trio of scientists from Colorado State University and Utah State University.

Timber milkvetch is a poisonous plant that affects cattle and occasionally sheep. Until recently, the poisonous substance contained by the plant was unidentified.

Members of the research team that determined the chemical structure of the poison included Dr. Frank R. Stermitz, associate professor of chemistry at CSU, and Drs. M. Coburn Williams and Frank A. Norris, both of Utah State.

"The plant grows at elevations ranging from 6,000 to 11,000 feet and is often found on dry hillsides and open meadows of Colorado, Utah, and southern Wyoming," Stermitz said. "Cattle of all ages are highly susceptible to the poisoning and readily eat the plant, even when other forage is available. Sheep graze it sparingly unless other forage is unavailable.

Closely related to locoweed, timber milkvetch emerges soon after snow melts in late May and early June. The plant reaches its peak in toxicity in June and July. After production of seeds in August, toxicity decreases as the stems and leaves dry.

Poison Rare

The researchers found that the poisonous effects of the plant are due to a glucose derivative of nitropropanol, an organic compound not previously known to exist naturally.

Timber milkvetch poisoning is characterized by general muscular weakness, paralysis of the leg muscles, irregular gait, frequent urination and nervousness. Characteristics also include rapid, weak pulse, white coloration of the lining of the mouth and eyes, coma and convulsions.

Approximately 1/2 pound of ingested milkvetch material is capable of killing a 500-pound calf. Some deaths occur within 1 hour after the plant is eaten. More often, animals die within 3 or 4 hours after eating the plant.

*Abstracted by "Range and Wildlife Abstracts - Rocky Mt. Region" from the October 1969 issue of COLORADO RANCHER AND FARMER.

Cattle breeders in British Columbia, where milkvetch is a particularly serious problem, have reported losing as many as 100 cattle in 1 day to milkvetch poisoning. In Utah, the deaths of as many as 39 cattle in a single day have been attributed to milkvetch poisoning.

Timber milkvetch is found in dense clumps, ranging in height from 6 to 10 inches. Before its blossoms appear, it resembles young alfalfa. Blossoms vary in color from creamy white to shades of violet. It cannot be detected by its smell, as can locoweed.

There is no known cure for timber milkvetch poisoning. Now that the toxic compound has been identified, scientists at Utah State hope to discover an antidote.

To control timber milkvetch, apply propylene glycol butyl ether esters of silvex or 2,4,5-T at 2 pounds of acid equivalent per acre. Treat before plants reach full bloom.

* * * * *

We're interested in everybody's
SAFETY
especially YOURS.

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A "big shot" is the executive
who
has his name printed on the letterhead
because
no one can read his signature.

THE DUDE RANCHER - Summer 1969

